MODULE 3

COASTAL REGULATORY PROTECTIONS

COASTAL REGULATORY PROTECTIONS: Regional/Local

OBJECTIVES:

- To provide an introduction to and basic understanding of coastal regulatory systems (national and regional).
- To give an overview of the regulatory instructions.

OVERVIEW:

- Outline of natural phenomena that are potentially hazardous.
- List of ecosystem attributes as natural hazards.
- Outline of positive and negative effects of selected natural phenomena for development activities.
- Examples of critical facilities that can be adversely affected by natural hazards.
- Presentation of premises and principles of Integrated Coastal Area Management.
- Traditional vs. Contemporary management approaches.
- List of environmental Regulatory and Economic Instruments.
- Outline of project approval process.
- List of requirements for effective control of coastal area.

POTENTIALLY HAZARDOUS NATURAL PHENOMENA

The impact of natural phenomena on the coastal environment is directly related to the inappropriate design and siting of tourism facilities. Natural events are potentially less damaging when they are anticipated and when their possible effects are carefully studied and factored into development planning. A list of potentially disastrous events is presented below as a guide to assist not only in siting and design but, also in "scenario planning" and forecasting within the tourism sector.

ATMOSPHERIC/ HYDROLOGIC

- Hailstones
- Hurricanes
- Lightning
- Tornadoes
- Tropical storms
- Coastal flooding
- Desertification
- Salinization
- Drought
- Erosion & Sedimentation
- River Flooding
- Storm surges

SEISMIC VOLCANIC

Fault ruptures

- Ground shaking
- Lateral spreading
- Liquefaction
- Tsunamis
- Projectiles and lateral blasts
- Seiches
- Pyroclastic flows
- Tephra (ash, cinders, lapilli)
- Gases
- Lava flows
- Mud flows

OTHER WILDFIRE; GEOLOGIC/HYDRAULIC

- Debris avalanches
- Expansive soils
- Landslides
- Rock falls
- Savannah
- Submarine slides
- Brush
- Forest
- Grass

ECOSYSTEM ATTRIBUTES AS NATURAL HAZARDS

Natural hazards impact ecosystems in different ways, but the cumulative effect of the destruction unleashed by nature is far reaching. Coastal zones and urban centres are particularly vulnerable as they support most of the tourism infrastructure in the Region. Natural hazards often convert these areas into blighted zones, and the ecosystems they support lose vigour and integrity. A non-exhaustive list of ecosystems which attributes as natural hazards is presented below.

1. Diseases and plagues (viruses, bacteria, flukes, parasites, fungi)
2. High Water
3. Avalanches (landslides, landslips, debris flows) debris

4. Wind (tornadoes, hurricanes, cyclones, dust storms)
5. Natural erosion and sedimentation
6. Temperature extremes
7. Extremes of humidity
8. Drought
9. Fog, mist
10. Solar radiation
11. Lightning
12. Fire
13. Toxic chemicals, gas concentrations
14. Nuclear radiation
15. Volcanoes
16. Earthquakes
17. Tsunamis
18. Seiches
19. Subsidence
20. Expansive soils
21. Noxious vegetation (poisonous plants, invader species)
22. Poisonous animals (reptiles, insects)
23. Predators.

Source: OAS/DRDE 1991

EFFECTS OF NATURAL PHENOMENON DEVELOPMENT ACTIVITIES

Because of the potential loss of life and property following a natural hazard, its negative effects are generally highlighted and the positive ones overlooked. Certain types of development activities can benefit in a positive way from such eventualities. Table 1 and Table 2 below, outline both negative and positive impacts of selected natural phenomena for development activities and main differences between hurricanes and earthquakes, respectively.

EFFECTS ON CRITICAL FACILITIES

Among the negative impacts of natural phenomena are damages to critical facilities which have the potential to place the entire tourism industry into a tailspin. A critical facilities guide is outlined below.

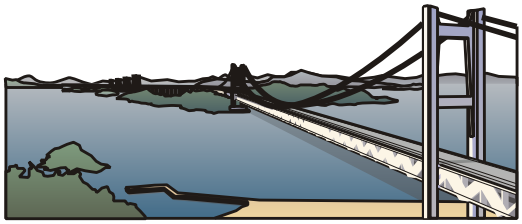
EXAMPLES OF CRITICAL FACILITIES THAT CAN BE ADVERSELY AFFECTED BY NATURAL PHENOMENA

PUBLIC SAFETY AND SECURITY

- Civil defence installations
- Communications centres
- Emergency management centres
- Fire stations
- Hospitals and other medical facilities
- Mass emergency shelters
- Police stations and other installations for public security

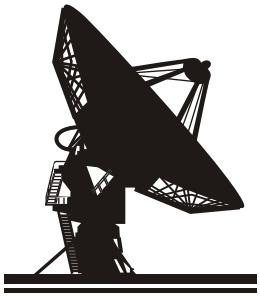
HIGH-DENSITY OCCUPANCY

- Auditoriums, theatres, stadiums
- Churches
- Educational facilities
- Hotels
- Office buildings
- Penal institutions



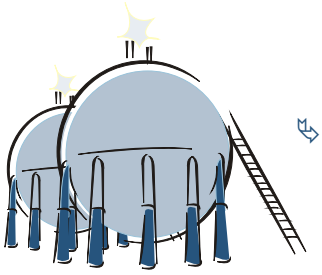
TRANSPORTATION

- Airways - airports, heliports
- Highways - bridges, tunnels, roadbeds, overpasses, transfer centres
- Railways - trackage, tunnels, yards, depots
- Waterways - canals, locks, seaports, ferries, harbours, drydocks, piers



UTILITIES

- Communications - lines, stations, printing presses, relay points, antenna complexes
- Electric power - water impoundments, fuel storage, generators, transmission lines, substations, switchyards
- Petrochemical installations -production, transmission, storage, terminals
- Potable water - collection, transmission siphons, flumes, treatment, storage
- Waste water - collection, treatment, discharge



INDUSTRIAL

- Corrosives - manufacture, transfer, storage, disposal
- Explosives - manufacture, transfer, storage, disposal
- Flammable materials - manufacture, transfer, storage, disposal
- Radioactive materials - manufacture, transfer, storage, disposal
- Toxins - manufacture, transfer, storage, disposal

AGRICULTURAL

- Food - storage, processing, transfer
- Irrigation systems
- Water containment - dams, reservoirs, levees, dykes, other impoundments

Module 3 - Table 1:
Examples Of Positive And Negative Effects Of Selected Natural Phenomena For Development Activities

Natural Phenomena	Positive Effects	Negative Effects
Hurricanes	Bring water, nutrients sediments and propagules.	Remove structures.
Low Temperature	By slowing down processes, allows for conservation and storage.	Freeze can be lethal.
High Temperature	Accelerates processes, particularly respiration and recycling.	Can be lethal; reduces species diversity.
Heavy rains	Trigger phenological events in deserts; relieve salinity in coastal environments; redistribute nutrients.	Remove structures and can cause other stresses such as flooding, which affects gas exchange of wetland sediments and turbidity in aquatic systems.
Fire	Makes nutrients and moisture more available; reduces competition.	Removes structures.
Salinity	Allows higher gross productivity in mangroves up to seawater concentrations.	At values higher than 35 parts per 1000, increases respiration rates and decreases transition net production rates.
Volcanic eruptions	Allows for better nutrient, moisture, and competitive environments.	Suffocate and kill plants and animals.
Flooding	Removes competition; triggers phenological events.	Increases energy maintenance costs; temporarily decreases the number of taxa and individuals.
Water flow	Transports nutrients and oxygen; removes toxins; redistributes larvae.	Removes structures; causes high maintenance costs to biota.
Tidal extremes	Redistribute nutrients, sediments, organic matter, and organisms.	Expose organisms to lethal conditions.

Module 3 - Table 2:
Main Differences Between Hurricanes And Earthquakes

ISSUE UNDER CONSIDERATION	WIND EFFECTS	EARTHQUAKE EFFECTS
(1) Source of loading	External force due to wind pressures	Applied movements from ground vibration
(2) Type and duration of loading	Wind storm of several hours duration; loads fluctuate, but predominantly in one direction	Transient cyclic loads of at most a few minutes duration; loads change direction repeatedly
(3) Predictability of loads	Usually good, by extrapolation from records or by analysis of site and wind patterns	Poor; little statistical certainty of magnitude of vibrations or their effects
(4) Influence of local soil conditions on response.	Unimportant	Can be very important
(5) Main factors affecting building response	External shape and size of building; dynamic properties unimportant except for very slender structures	Response governed by building dynamic properties: fundamental period, damping and mass
(6) Normal design basis for maximum credible event	Elastic response required	Inelastic response permitted, but ductility must be provided; design is for a small fraction of the loads corresponding to elastic response
(7) Design of non-structural elements	Loading confined to external cladding	Entire building contents shaken and must be designed appropriately

Source: The Arup Journal, Arup International Consulting Engineers

BUILDINGS ARE VULNERABLE TO HURRICANES

Consider carefully:

Site and orientation

Sites should be sheltered and be accessible at all times from centres of population.

Where there is a history of flooding in the region developers should acquaint themselves with the history of the area before deciding to construct; this would help to minimise loss of property and life when flooding occurs.

Shape of the facility

Avoid Pockets in building plans.

Avoid 'T' or 'L' shaped buildings - they channel the wind into the junction of the two wings, leading to failure.

Rectangular shaped buildings should have a length to width ratio of 3:1 or less.

Foundations

Foundations should be reinforced with the use of mild steel bars.

Bars should project beyond the foundation by at least 12 to 14 inches to facilitate the securing of the structure to the foundation.

If wood posts are used instead of concrete blocks or column foundation, the post should be treated with preservative and then buried in concrete at least 4 to 8 inches into the ground.

The post should have a minimum dimension of 6 x 6 inches .

The minimum diameter for round posts should be 8 inches.

Foundations of buildings located in flood plains must be designed to withstand dynamic water force and battering action from floating debris and from the effects of erosion due to scouring.

Framing and cladding

Use metal straps (T's and L's) plus corner braces to secure studs to top and bottom plates and at the corners of the structure.

The space between the roof and wall should be closed up. Ventilation space should be left in gable ends.

Design of fixings is important as this provides strength and flexibility.

Joints and junction of panels should be carefully designed against leaking.

Glass curtain wall systems must be avoided, or protected against flying debris.

Roofs

The failure of the exposes the interior of buildings to devastation and often contributes to the weakening and further collapse of the remaining structure.

More damage and death are caused by roof failure than by any other factor.

CHECK FOR THESE STANDARDS!

- Hip or gable shaped roofs with 30 degree slope minimum.
- Over hang of approximately 8" horizontal, unless enclosed.
- Rafters attached to wall plate with twisted metal straps.
- Rafters located at 2' - 0".
- Every second set of rafters connected by collars or ties beneath the ridge board.
- Cross laths (purlins) located at 1' - 0".
- Galvanized sheets of no thinner than 26 gauge. (24 gauge is the recommended thickness).
- Galvanized sheets should overlap to at least one complete corrugation but preferably two complete corrugations.
- Galvanized sheets should overlap at least 10" when they are joined lengthwise.
- Galvanized sheets should be nailed at the top of every corrugation at eave and ridge board.
- Ridge is capped and nailed.
- Dome head galvanized nails or washered bolts used for roofing.
- Porch/verandah roof is separate from building roof and can break away.
- Plates tied to ring beams or other structures at regular intervals; and through main walls to foundations at selected points.
- Extended eaves should be avoided.
- Pockets under eaves should be minimised by boarding or sheeting to the underside. Detail at ends of eaves should protect open edges of sheet covering to avoid uplift.
- Fascia boards must be installed.
- Ventilation should be provided to boxed eaves to remove humidity and most importantly to equalise the interior and exterior pressures; they should be placed in overhangs.
- Eaves should be as short as possible; shorter eaves reduce the upward thrust by the action of hurricane winds.
- Gutters should be securely fixed.
- Sheet and ridge cap should be made to overlap the barge board and be secured with 1" nails.
- Waterproof washers should be used to avoid loosening by vibration
- Install hurricane clips to connect the studs to the plate and to connect the roof rafters to the studs- this is an important exercise and is not costly.
- Strengthen the connections of the supports of the balcony roof.

Porches

- Avoid half porches, as wind trapped underneath an open or half porch will increase high uplift forces on the roof.
- Roofs of full porches should be separated from the rest of the house so that during hurricane the main structure will not be damaged.

Shutters and Windows

- Provide shutters for all windows. Glass doors and windows offer very little resistance to high winds
- Glass should be reinforced or otherwise prevented from shattering.
- Timber or metal louvres have been proven to have the highest resistance from damage. Glass is prone to shattering from flying debris.
- All windows should be carefully designed, with a properly fixed frame to avoid entire banks of windows being blown in or sucked out.
- Awning type windows are generally not recommended as those that are available are structurally inferior.
- All parts of buildings (doors roofs, cladding) should be designed to withstand high wind pressure including suction.
- Ensure persons involved in construction are sufficiently experienced and qualified in hurricane and flood resistance.
- Secure all plates to foundations by means of bolts, straps, wood bracing or using Special connectors to resist wind or water pressures.

MAINTENANCE IS IMPORTANT TO VULNERABILITY REDUCTION

Inspect -

- foundations and repair as necessary.
- roofs including claddings and repair as necessary.
- for sign of structural failures and repair immediately
- electrical installations periodically for sign of wear and loose connections which could lead to malfunctioning and correct immediately.
- external drains and manholes and keep free.
- for termite treatment infestation.
- all building fixtures and fittings; repair and replace as necessary.
- rainwater disposal systems, and maintain to ensure that water flows freely and discharges away from foundations.
- ground water gradients and maintain to ensure run off away from the building.

Where building components, including fixtures and fittings do not conform to safe and acceptable design standards, these should be modified and improved as necessary.

- ground surface gradients and drainage systems and keep free of dirt and debris.
- piling on wharfs, piers and jetties (timber, steel and concrete) and repair and replace as necessary.
- decks and repair all faults.
- sea walls for signs of structural failure and undermining, and repair as necessary.
- gabions and groynes for signs of instability and correct any defects.

All maintenance activities should be systematised and the anticipate-and-prevent approach adopted rather than the react-and-cure approach.

Proper maintenance should ensure that the facility can:

- function at its designed level at all times
- function for the normal life span of the building and of the plant
- resist the effects of extreme natural events such as hurricanes, floods, and earthquakes without damage to its occupants and with minimal repair or rehabilitation necessary after the passing of the event

PREMISES AND PRINCIPLES OF INTEGRATED COASTAL AREA MANAGEMENT

Coastal area management is a comprehensive and integrated planning process. There is no shortage of definitions for the concept of integrated coastal area management (ICAM). A number of recent examples were provided by UNEP (1996) in "Guidelines for Integrated Planning and Management of Coastal and Marine Areas in the Wider Caribbean region".

The Food and Agricultural Organization of the United Nations (FAO) has developed several principles, which, if followed, can help to lessen the impact of tourism infrastructure on the Caribbean region. In order to ensure sustainable use of the coastal resources, development planners should be guided by these principles.

Principle 1: The coastal area is a unique resource system which requires special management and planning approaches.

Principle 2: Water is the major integrating force in coastal resource systems.

Principle 3: It is essential that land and sea uses be planned and managed in combination.

Principle 4: The edge of the sea is the focal point of coastal management programmes.

Principle 5: Coastal management boundaries should be issue-based and adaptive.

Principle 6: A major emphasis of coastal resources management is to conserve common property resources.

Principle 7: Prevention of damage from natural hazards and conservation of natural resources should be combined in ICAM programmes.

Principles 8: All levels of government within a country must be involved in coastal management and planning.

Principles 9: The nature-synchronous approach to development is especially appropriate for the coast.

Principle 10: Special forms of economic and social benefit evaluation and public participation are used in coastal management programmes.

Principle 11: Conservation for sustainable use is a major goal of coastal resources management.

Principle 12: Multiple-use management is appropriate for most coastal resource systems.

Principle 13: Multiple-sector involvement is essential for sustainable use of coastal resources.

Principle 14: Traditional resource management should be respected.

Principle 15: The environmental impact assessment approach is essential to effective coastal management.

TRADITIONAL VS. NON-TRADITIONAL APPROACHES

The FAO premises and principles, outlined above, take the non-traditional management approach which seeks to integrate the environment within the overall management framework.

Traditional management approaches with respect to the environment were generally limited to mere compliance to basic legal requirements.

TRADITIONAL MANAGEMENT APPROACHES

- National Physical Plans
- Land Use Plans
- (Regional) Development Plans
- Sectoral Plans
- Fish Sanctuaries/Reserves
- Closed Seasons
- Protected Species Listing
- Use of Regulatory Instruments

MORE RECENT POLICY & MANAGEMENT APPROACHES

- National Conservation Strategies
- Country Environmental Profiles
- National Environmental Action Plans
- Integrated Planning/Creation of Umbrella Environmental Management Agencies
- Protected Areas System Planning
- Integrated Coastal Area Management
- Disaster/Contingency Planning
- Environmental Reporting
- Use of Regulatory Standards
- Environmental Impact Assessment
- Public Education/Environmental Curriculum Development
- Restoration of Degraded Ecosystems
- Use of More Economic/Financial Instruments
- Wider Partnerships with Civil Society

ENVIRONMENTAL REGULATORY & ECONOMIC INSTRUMENTS

The regulatory environment within which development takes place, and the economic instruments, which are tools that can measure inputs within the tourism sector against outputs, are important both from a local and regional perspective.

The Regulatory Instruments are:

- Zoning Ordinances
- Permits and Licences
- Standards
- Discharge Limits
- Environmental Reporting

The Economic Instruments used to valuate negative and positive externalities are:

- Charges
- Subsidies
- Grants
- Differential Interest Rates
- Differential Tax Rates
- Differential Import Duty Charges

PROJECT APPROVAL PROCESS

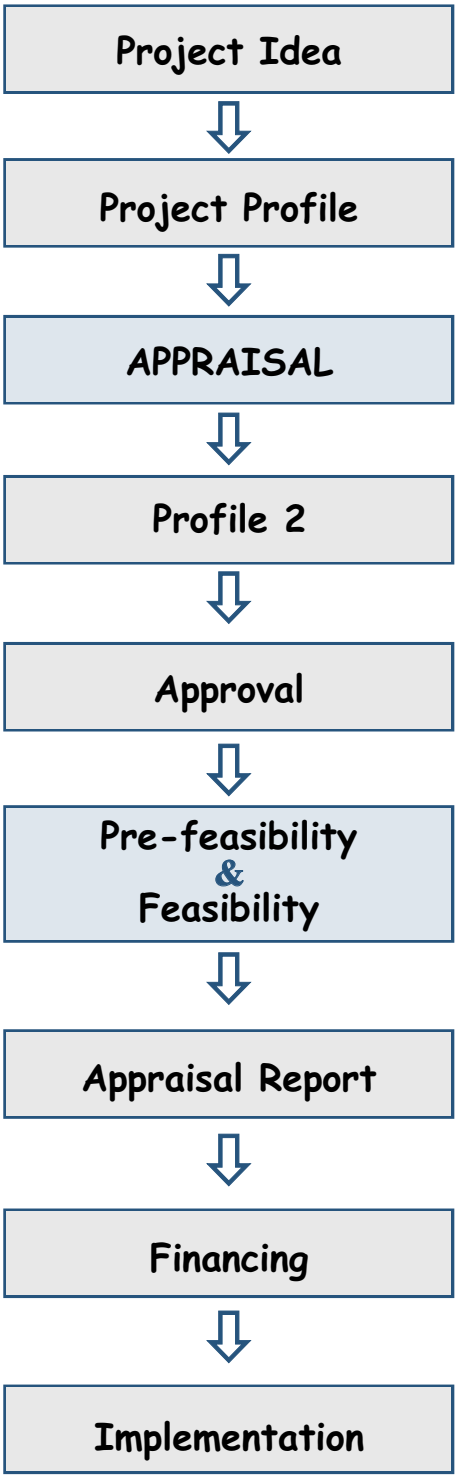
Like other forms of development, the design and siting of tourism facilities is a process which requires approval from the relevant legislative body. Basic steps have been developed to guide one through the process and are outlined in Figure 1 below.

ISSUES CONSIDERED IN PROJECT ANALYSIS

Each aspect of any proposed project must be analysed to determine its feasibility and to help identify its environmental impacts. The issues that are normally considered fall into the following categories:

1. Technical
2. Commercial
3. Financial
4. Economic
5. Institutional
6. Social
7. Environmental

Module 3 - Figure 1:
Simplified Project Approval Process



The environmental factors usually considered are:

1. Production of air or water pollution
2. Creation of noise
3. Spread of disease or health risks
4. Soil or beach erosion
5. Depletion of marine life or resources
6. Creation of slum housing
7. Failure to conserve wildlife or historical relics.

Some Deficiencies in a Project-based Approach to EIA

Environmental Impact Assessments (EIAs) are the primary tools employed to identify and assess the potential negative and positive effects of development projects on environmental resources. Each development is normally treated as a discrete entity (a project), and only issues specific to that project are presented. Deficiencies identified in the process include:

1. An assessment of individual projects does not permit the cumulative effects of many projects to be addressed.
2. EIA of projects is a reactionary process which does not promote regional planning.
3. Project-based EIA cannot bring about required changes in the policy contexts from which the projects are derived.
4. The economic, social, and cultural aspects of development proposals are as important as the scientific and technical aspects of environmental protection.

There is a need to encourage more public involvement in government and corporate decisions that will affect the lifestyles of affected people.

Although considered to be the most appropriate appraisal method, project-based EIAs are considered to be deficient in a number of areas. The disadvantages and advantages of this approach are cited below.

Advantages of policy/plan EIAs

1. It is easier to consider environmental impacts and alternatives on a more comprehensive scale.
2. It provides an approach to consider multiple source impacts, which may involve different jurisdictions.
3. Cumulative and synergistic impacts are more easily addressed, given the more comprehensive approach and the temporal and spatial scales involved.
4. Environmentally-sound policy and planning decisions will enable time savings to be made later on in the decision-making process.
5. It will enable the preparation and development of monitoring programmes which will be on-going by the time project decisions are made.
6. It will enhance the preventative and anticipatory intrinsic character of EIA.

7. It is easier to design strategies that address short-term impacts by focusing on long-term impacts

8. There is a synergistic effect of both planning and EIA, which may encourage earlier public participation with greater involvement at preliminary planning stages.

9. Problems of uncertainty can be addressed and managed by identifying priority areas for further investigation.

Disadvantages of policy/plan EIA

1. There is greater analytical complexity in the estimation of multi-source impacts, as a plan is concerned with many potential developments in different locations and involves many different policies.

2. There are problems in focusing the study, based on a lack of site-specific environments.

3. There are different levels of precision concerning the nature, scale, and location of the activities concerning a plan.

4. There is less practical experience in the environmental assessment plans, both in terms of procedures and methods.

5. The investigations of environmental conditions required for plans may be less clear-cut.

6. There is imprecise knowledge of the future and specific developments.

7. There is usually freedom to establish goals and objectives which are potentially broader than the plan themselves.

8. There are more viable technical and institutional options, which increase the availability of alternatives.

9. There is a long lead-time in plan preparation and the period over which the plan will operate, requiring greater flexibility to respond to changing circumstances outside of the control of the plan.

10. Flexibility in the implementation of plans/policies makes it difficult to know what and how to monitor.

11. There is a lack of specific predictive and evaluation methods, given problems of uncertainty.

EFFECTIVE MANAGEMENT OF COASTAL RESOURCES

The following requirements are necessary, and must be put in place to ensure the effective management and control of coastal areas.

1. Clearly articulated coastal management policy and programme.

2. Integration of sectoral polices and plans at the appropriate level.

3. Clearly defined institutional framework.

4. Adequate legislative framework that facilitates the use of regulatory, economic, and voluntary control measures.

5. Adequate database of coastal resources, forms, and processes.

6. Systematic use of standard methods for assessment of policies, plans and projects.

7. Design standards to reduce damage from natural disasters and to prevent damage to coastal ecosystem processes.

8. Adoption/development of sound technologies and use of sustainable practices.

9. Improvement in the management capacity of regulatory agencies.

10. Greater inclusion of concerned parties/communities in the management process.

11. More effective public awareness programmes.